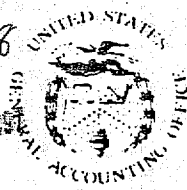


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REPORT TO THE CONGRESS

*BY THE COMPTROLLER GENERAL
OF THE UNITED STATES*

National Water Quality Goals Cannot Be Attained Without More Attention To Pollution From Diffused Or "Nonpoint" Sources

Water quality goals cannot be achieved in many rivers and lakes because of diffused, or "nonpoint," sources of water pollution. Limited controls exist and agencies developing comprehensive control plans under grants from the Environmental Protection Agency lack sufficient resources to gather needed data--a result of past and current emphasis on controlling industrial and municipal point sources of water pollution.

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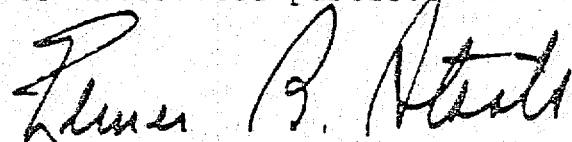
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To the President of the Senate and the
Speaker of the House of Representatives

This report discusses the need for a greater Federal, State, and local effort to control nonpoint sources of water pollution. Nonpoint pollution is a serious problem in many national waterways because it destroys aquatic life, involves great expense to clean up its damage, and will prevent the achievement of 1983 water quality goals.

We made our review pursuant to the Budget and Accounting Act, 1921 (31 U.S.C. 53) and the Accounting and Auditing Act of 1950 (31 U.S.C. 67).

We are sending copies of this report to the Acting Director, Office of Management and Budget; the Administrator, Environmental Protection Agency; the Chairman, Council on Environmental Quality; and other interested parties.


Comptroller General
of the United States

COMPTROLLER GENERAL'S
REPORT TO THE CONGRESS

NATIONAL WATER QUALITY GOALS
CANNOT BE ATTAINED WITHOUT
MORE ATTENTION TO POLLUTION
FROM DIFFUSED OR "NONPOINT"
SOURCES

D I G E S T

"Nonpoint" sources of water pollution--sediment, acid mine drainage, pesticides, and other pollutants carried into streams by runoff from rainstorms--currently produce more than half of the pollutants entering the Nation's waterways. GAO reviewed overall efforts to control nonpoint sources of pollution and concluded that progress has been minimal. If not controlled, nonpoint pollution will prevent attainment of national water quality goals and will continue to grow in significance as "point" sources of pollution such as factories and municipal waste treatment plants are brought under control. (See ch. 1 and pp. 14 and 26.)

Discharges of nonpoint pollution can occur anywhere along a water body in contrast to sources where the point of discharge is from a pipe or other conduit. Because the source of discharge is diffuse, nonpoint pollution is difficult to collect and treat. The best way to control it is to prevent as much of it as possible from reaching the water through proper management of the land. A terraced field, for example, is less likely to erode than a field tilled up and down the slope. (See ch. 1.)

The Environmental Protection Agency should do more to plan solutions to nonpoint sources of water pollution. To do so, the Agency should start a program to collect adequate data on nonpoint sources; elicit more help from other Federal agencies with resources available for use in this work; and develop legislative proposals for additional resources, after resources for planning and control are assessed. The Agency also needs to place responsibility for administering nonpoint source functions at a higher management level and should develop procedures to identify budgeted and actual expenditures

related to nonpoint planning and control. (See p. 27.) Agency funds earmarked for nonpoint sources are not readily determinable but in fiscal year 1976 were far less than the \$109 million earmarked for point sources. (See p. 16.)

During oversight hearings the Congress should inquire about the Agency's assessment of additional nonpoint source needs and ways to allocate future funds which may be provided for nonpoint source controls. (See p. 28.) More attention is needed for two reasons.

First, nonpoint sources can render streams and lakes too polluted for fishing and swimming. Federal and State water quality officials believe that 1983 goals for fishable and swimmable waters cannot be attained in many areas due to this pollution. Iowa and Pennsylvania officials have estimated that billions of dollars are needed to control the most serious types of nonpoint pollution in their States. (See pp. 6 through 9.)

Second, State and local agencies planning solutions to control nonpoint sources are not using adequate data for planning. These agencies need data which shows the impact on water quality of nonpoint sources of pollution and various control techniques, but cannot collect it due to several program constraints, such as lack of time to gather adequate data and insufficient Federal funding assistance. The constraints are directly attributable to past and current emphasis on controlling point sources of pollution. However, this emphasis has resulted in progress in providing clean water for the future. At the time of GAO's review, the Congress was considering legislation that would permit the Agency to delay industry and municipal compliance with point source control requirements. (See pp. 9 through 13 and 15 through 22.)

Because total funds for water pollution control are limited, better data is needed to set priorities and evaluate alternatives for controlling water pollution. Constructing another point source control project, for example, may not improve water quality as much as implementing

practices to control nonpoint pollution. Better data is needed, also, to prevent implementation of unnecessary water pollution controls and to convince landowners and developers that practices to control nonpoint sources of water pollution are needed. (See pp. 11 through 13.)

The Agency agrees that a greater nonpoint source control effort at the Federal, State, and local level is needed. It believes, however, that the present program structure is the best possible, considering the various program constraints. (See pp. 28 and 29 and p. 44.)

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ABBREVIATIONS

EPA	Environmental Protection Agency
JTU	Jackson Turbidity Units

CHAPTER 1

INTRODUCTION

Sources of water pollution include factories and municipal waste collection facilities which discharge treated or untreated wastewater into rivers and streams. These sources are called point sources because the point of discharge can be readily identified.

Nonpoint sources of pollution generally involve the contamination of receiving waters by storm runoff. Nonpoint pollution is difficult to identify, measure, and treat because it enters the water diffused and diluted rather than from a pipe. Consequently, its impacts are often less concentrated and conspicuous but not necessarily less harmful than the impact of pollution originating from point sources.

Pollution from nonpoint sources constitutes an important national problem. According to Environmental Protection Agency (EPA) estimates, nonpoint sources produce more than half of the pollutants entering the Nation's waterways, and this percentage will increase as progress is made in abating point sources of pollution.

In this report we examine the severity of the nonpoint problem in relation to achieving national water quality goals. Also, we discuss (1) actions taken to control nonpoint sources of water pollution and (2) additional actions needed to help meet national water quality objectives.

NONPOINT SOURCES OF POLLUTION

Major and essential functions; such as agriculture, mining, road and building construction, and silviculture (forestry); are among the causes of water pollution. These functions contribute several contaminants to surface and ground waters.

In volume, the major pollutant is sediment from soil erosion. The principal contributor is agriculture; 50 percent or more of the sediment deposited in streams and lakes comes from cropland. Construction sites and mines also yield large quantities of sediment. Generally forests are free of erosion unless disturbed by fire or timber harvesting. Then, the amount of erosion depends on the fire's severity or whether timber harvesting was managed poorly. Erosion depletes topsoil from farming land, and the resulting sediment transports other pollutants; such as pesticides,

excess nutrients, and pathogens; covers feeding and spawning areas; and raises stream beds, which causes flood waters to reach higher levels.

Pollution from mining may be point or nonpoint and occurs in many ways. For example, acid water forms when water contacts mine wastes and ore. Acid drainage from abandoned mines is a common nonpoint problem in the coal and other mining industries. In addition, mine drainage may carry (usually in trace quantities, but toxic at high concentrations) lead, arsenic, zinc, cadmium, copper, and other pollutants. Such pollution can be a serious problem to communities located near the source of the drainage, and it is a substantial economic and environmental burden to urban areas in heavily mined regions.

Nutrients, particularly nitrogen and phosphorus, come from all lands, including lawns in residential areas. However, lands used to produce crops and support livestock contribute the largest amount. An estimated 1 million metric tons of nitrogen found in surface and ground waters are the result of using fertilizers.

Pesticides are used widely in agriculture and somewhat in silviculture, construction, and mining. They are transported to water by direct application, spray drift, runoff, and ground seepage. The extent of the hazard depends on the pesticides' properties and the care exercised in their use.

Organic wastes from nonpoint sources--crop residue, forest litter, livestock and petroleum product wastes, and other solid waste materials--are transported to streams chiefly in runoff water from all types of land and affect streams in essentially the same way as organic wastes from point sources. These wastes sometimes carry disease-causing organisms.

The impact of nonpoint pollution on water quality depends on how well agriculture, silviculture, construction, and mining are managed because some management practices are more effective than others in preventing water pollution. For example, a terraced field is less likely to erode than a field tilled up and down the slope, well-designed haul roads in silviculture and construction erode less severely than unplanned roads, and reclaimed strip-mined areas cease to be large sources of acid drainage, mineral pollutants, and sediments.

FEDERAL WATER POLLUTION CONTROL
ACT AMENDMENTS OF 1972

The Federal Water Pollution Control Act Amendments of 1972 (Public Law 92-500) (33 U.S.C. 1251 et seq., Supp. V, 1975) established a goal of eliminating by 1985 the discharge of pollutants into the Nation's navigable waters and an interim goal of providing by July 1, 1983, wherever attainable, water quality sufficient for recreation and the protection and propagation of fish, shellfish, and wildlife. The Administrator of EPA is charged with directing efforts to achieve these goals.

The amendments provided for (1) Federal grants of 75 percent of the costs of constructing publicly owned sewage treatment works, (2) the regulation of the amount of pollutants that can be discharged from point sources through a permit system, (3) the planning of solutions to water quality problems, and (4) research and demonstration to develop technology to eliminate the discharge of pollutants into navigable waters.

Unlike point sources, EPA has no direct authority under the amendments to regulate nonpoint sources. However, various sections of the amendments provide EPA with the authority it needs to organize a nonpoint source program. The primary section is 208, which requires State and local agencies with jurisdiction in areas having severe water quality problems to prepare an areawide waste treatment management plan. This plan must (1) identify areas needing municipal and industrial waste treatment facilities; (2) establish priorities for constructing such facilities; and (3) identify the nature, scope, and extent of nonpoint sources of water pollution as well as ways to control them. The amendments did not provide funds for implementing nonpoint controls or set forth comprehensive requirements regarding their use.

Also, some States have legislation addressing aspects of nonpoint pollution, such as control of sediment, and some Federal agencies' legislative authority indirectly addresses this problem. Federal activities include soil conservation efforts; management of the national forests and other lands; and projects to control floods, generate power, and provide irrigation water.

SCOPE OF REVIEW

Our review was made to determine whether nonpoint sources of water pollution will prevent achieving 1983 water quality

goals, the extent to which nonpoint sources have been identified and control measures implemented, and additional needs to meet the goals of the amendments.

To do this we examined the roles and accomplishments of selected Federal, State, and local agencies involved in nonpoint planning and control. These agencies included EPA headquarters, Washington, D.C.; EPA regional offices in Philadelphia (region III), Denver (region VIII), and Seattle (region X); and State agencies administering nonpoint activities in Colorado, Maryland, Montana, Oregon, Pennsylvania, and Washington. We also obtained information from EPA regional offices in Atlanta (region IV) and Kansas City (region VII), State agencies in Georgia and Iowa, and the Departments of Agriculture and the Interior.

In addition, we developed case studies (app. II through VI) to show the effects of nonpoint pollution and difficulties in controlling it as well as actions which have been taken. Because of the broad scope of the nonpoint pollution problem, we limited the case studies to the activities discussed in this chapter--agriculture, construction, silviculture, and mining. However, other serious sources of nonpoint pollution exist, such as urban drainage. Appendix I lists all categories of nonpoint sources of water pollution identified by EPA.

Prior reports we issued relating to nonpoint sources of water pollution include:

- "Dredging America's Waterways and Harbors--More Information Needed On Environmental and Economic Issues;" Corps of Engineers (Civil Functions), Department of the Army, Environmental Protection Agency; June 28, 1977 (CED-77-74).
- "To Protect Tomorrow's Food Supply, Soil Conservation Needs Priority Attention;" Department of Agriculture; February 14, 1977 (CED-77-30).
- "Better Data Collection and Planning Is Needed to Justify Advanced Waste Treatment Construction;" Environmental Protection Agency; December 21, 1976 (CED-77-12).
- "Better Federal Coordination Needed to Promote More Efficient Farm Irrigation;" Department of the Interior, Department of Agriculture, Environmental Protection Agency; June 22, 1976 (RED-76-116).

--"Problems Caused By Coal Mining Near Federal
Reservoir Projects;" Corps of Engineers (Civil
Functions), Department of the Army; October 2, 1973
(B-177092).

CHAPTER 2

BETTER INFORMATION ON NONPOINT SOURCES

OF WATER POLLUTION NEEDED

The Environmental Protection Agency estimates that nonpoint sources of water pollution account for more than half of the pollutants entering national waters. Moreover, Federal and State officials agree that in many areas 1983 fishing and swimming goals cannot be attained because of nonpoint pollution.

Even though consensus exists that nonpoint pollution is a serious problem, data needed to quantify and control it is incomplete. To develop an adequate nonpoint pollution control program, more and better data is needed on

- specific sources of nonpoint pollution and their impact on water quality and
- water quality improvements to be derived from various control techniques.

NONPOINT POLLUTION GREATLY AFFECTS MANY STATES

Describing the extent of the national nonpoint pollution problem is difficult because of variations from region to region and sometimes in the same location between storms. Of the States we visited, acid mine drainage is considerable in Pennsylvania and Colorado, and silviculture and agriculture are leading sources of nonpoint pollution in the Pacific Northwest. The States we visited lacked comprehensive data on the impacts and extent of nonpoint sources of pollution. EPA said that nationally such data is essentially nonexistent. Nevertheless, problems caused by nonpoint pollution become increasingly obvious as industrial and municipal point sources of pollution are controlled.

According to EPA, even if all point source dischargers are controlled, water quality goals cannot be attained in many areas because of nonpoint pollution. EPA's May 1976 report to the Congress on an inventory of the Nation's water quality pointed out that 37 of 45 States reporting that some portion of State waters will not meet 1983 water quality goals cited nonpoint sources of pollution as one reason.

Pennsylvania's Department of Environmental Resources estimates that 2,021 of the State's 14,163 miles of major streams--1 out of every 7--will not meet 1983 water quality goals because of acid drainage from abandoned mines, either by itself or combined with other sources of pollution.

Effects of nonpoint pollution

Nonpoint pollution impacts on water quality depend on various factors, such as the type and amount of pollution entering receiving water and the quality and volume of that water. Noticeable effects occur from some nonpoint sources, such as acid mine drainage, while others, like pesticides runoff from croplands, are not as noticeable. With either type, damage from nonpoint pollution often makes streams and lakes unsuitable for fishing, swimming, and other recreation. This pollution can (1) destroy aquatic life, (2) involve great expense to clean up its damage, and (3) harm people.

In Colorado a 20-mile segment of a mountain stream contained no aquatic life (see fig. 1) because of drainage from mines operating intermittently between the 1870s and the late 1960s. Acid water draining from the mines passed through mine wastes that were dumped in the stream and leached metals into the stream. U.S. Geological Survey data collected in 1972 and 1973 showed that manganese, zinc, iron, copper, cadmium, and lead levels exceeded tolerable limits for aquatic life.

In Washington improper logging road construction practices caused an earthfill to wash out into a stream. Tons of silt and debris were carried downstream about 11 miles. The slide occurred before the migration of juvenile salmon inhabiting the area, and the salmon were killed. Recovery of the area from natural flushing appears to be progressing slowly. An inspection of the spawning areas 2 years later showed severely degraded conditions. Salmon production from the slide area to about 8 miles downstream is expected to be insignificant. (Fig. 1 illustrates storm runoff of sediment from silviculture.)

Pesticides DDE, DDT, and dieldrin in the Iowa River in Iowa exceeded levels recommended by the National Academy of Sciences. Studies conducted at Coralville Reservoir on the river indicated that these pesticides came from agricultural runoff and were concentrated in algae and fish. Bottom feeding fish particularly contained excessive dieldrin levels, a suspected carcinogen. Although EPA suspended most uses of aldrin-dieldrin compounds in 1974, an EPA region VII

FIG. 1



EFFECTS OF ACID MINE DRAINAGE ON A
COLORADO MOUNTAIN STREAM



STORM RUNOFF AFTER A LIGHT
RAINFALL FROM SILVICULTURAL
OPERATIONS IN WASHINGTON

official said that the suspension has not eliminated the effects of dieldrin, and commercial fishing is not permitted in the river. Dieldrin is a persistent chemical that continues to show up in water quality samples. (Fig. 2 shows sediment in the reservoir from agricultural runoff and a major cause of the runoff--stream banks not protected from erosion by plant life.)

Nonpoint sources of water pollution were linked to the formation of suspected carcinogenic compounds recently discovered in the water supply of Fairfax County, Virginia. EPA conducted tests during the summer of 1976 and found that the county's treated supply of drinking water contained an average of 232.6 parts of chloroform for each billion parts of water, exceeding the EPA suggested maximum contaminant level of 100 parts per billion.

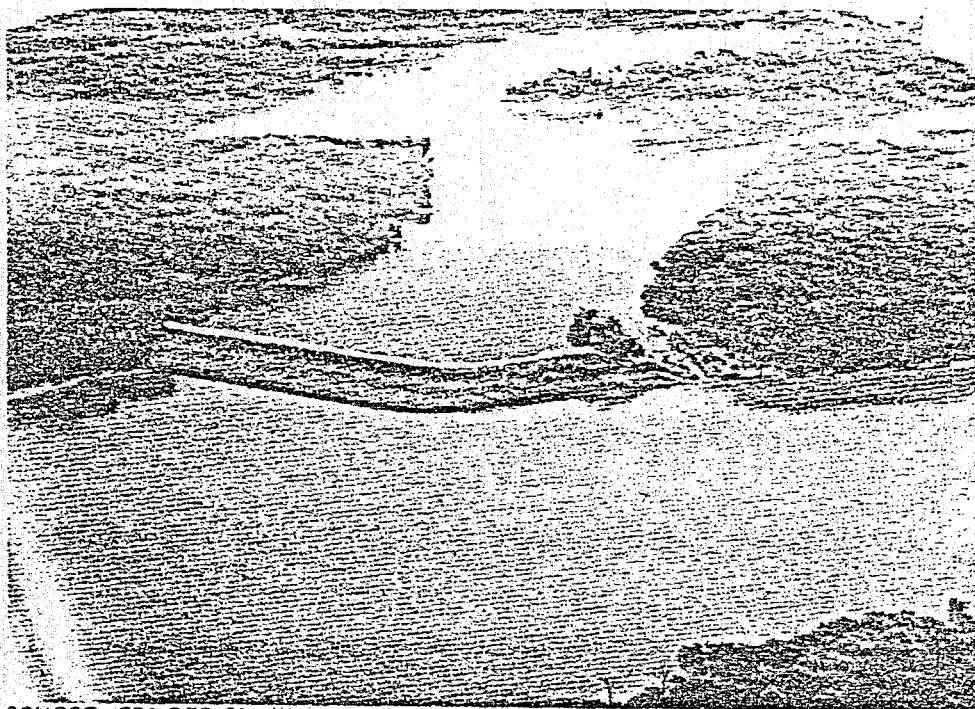
The Food and Drug Administration banned chloroform in a variety of products, such as cough medicines and mouth washes, because it is a suspected carcinogen. It was produced in Fairfax County's drinking water during the treatment process by the chemical interaction of organic materials present in the reservoir and chlorine, which is used to disinfect drinking water.

Scientists who monitored the reservoir stated that approximately 90 percent of the nitrates, phosphates, and suspended solids that entered the reservoir came from nonpoint sources induced by man or naturally decaying material. Sewage discharges from upstream industrial and municipal treatment facilities account for the remaining input of organic material into the reservoir. EPA officials believe that the chloroform levels can be reduced by control of the nonpoint sources or better management of the chlorination process.

Costs of nonpoint pollution include the loss of recreation and other benefits, as well as restoration costs. Pennsylvania officials estimated that \$3 billion will be needed to restore State streams polluted by acid mine drainage from abandoned mines. A State official said that this estimate is based on the actual experience of restoring 50 miles of stream degraded by acid mine drainage at a cost of \$60 million.

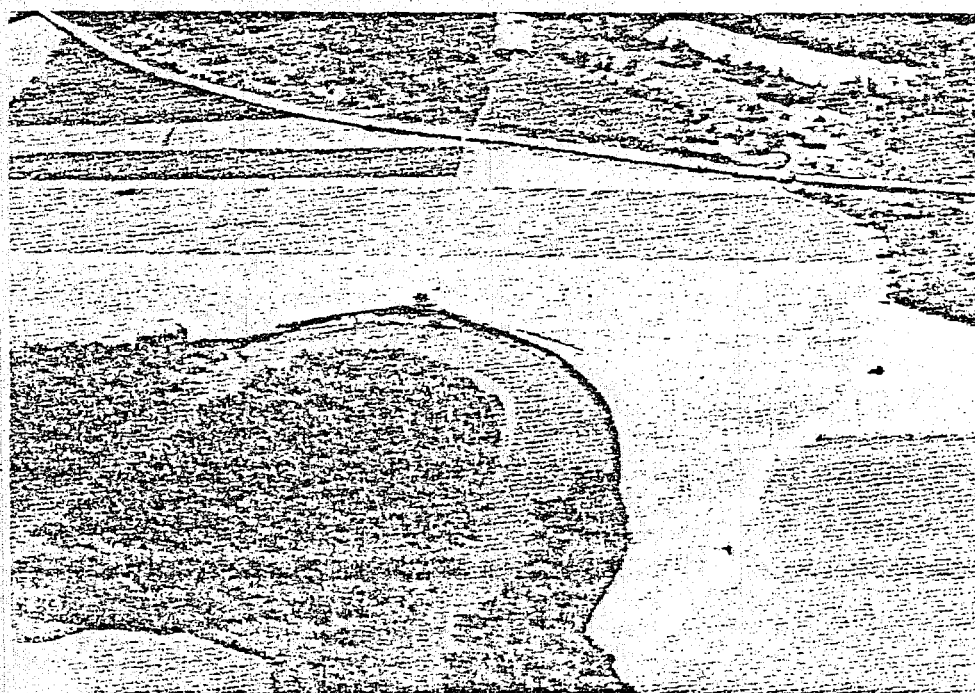
Sediment runoff from agricultural lands and other sources must be removed periodically to keep shipping channels at navigable depths, and about 750 million cubic yards of sediment are dredged annually from the Nation's

FIG. 2
IMPACT OF IMPROPER AGRICULTURAL PRACTICES ON WATER BODIES.



SOURCE: EPA REGION VII

SEDIMENT-LADEN CORALVILLE RESERVOIR NEXT TO A CLEAR LAKE.



SOURCE: EPA REGION VII

UNPROTECTED STREAMBANKS ON THE IOWA RIVER JUST UPSTREAM FROM
CORALVILLE RESERVOIR

waterways. In fiscal year 1976 the Corps of Engineers dredged about 287 million cubic yards of sediment at a cost of \$240 million. Moreover, disposing of dredged material poses environmental problems, which are discussed at length in our June 28, 1977, report on "Dredging America's Waterways and Harbors--More Information Needed on Environmental and Economic Issues (CED-77-74)."

DATA REQUIRED FOR AN EFFECTIVE CONTROL PROGRAM

The State and local planning agencies we visited lacked the data necessary to develop an effective nonpoint source control program. Developing a control program requires assessing each river basin to identify (1) nonpoint sources of pollution, (2) the extent and impact of these pollutants on water quality, and (3) control methods. This data is needed because funds for pollution control are limited; therefore, decisions of which control projects to finance should be made on the basis of which projects will benefit water quality the most.

The current data base is inadequate for making these decisions because the characteristics of nonpoint pollution make data gathering difficult and program constraints prevent State and local agencies from effectively collecting the necessary data. The characteristics of nonpoint pollution and a general description of the data needs are discussed in this chapter. Chapter 3 discusses program constraints.

Comprehensive data on sources and impact of nonpoint pollution is needed to select pollution controls

Information exists on specific categories of nonpoint pollution in a State; however, comprehensive statewide assessments of all categories of nonpoint pollution affecting each river basin are not available. For example, Pennsylvania identified stream miles degraded by mining activities but had not performed intensive surveys of other categories of nonpoint pollution.

Comprehensive nonpoint data is not available, for example, for the Potomac River Basin--one of the most visible river basins in America. According to a December 13, 1976, report of the House Committee on the District of Columbia, a comprehensive monitoring program is needed to assess the impacts of toxic substances and sediment in the Basin. The committee report noted that water quality monitoring for nonpoint pollution was insufficient and nonpoint pollution

from upstream land practices had severely degraded Basin spawning areas.

Estimates of the overall extent of nonpoint pollution, in some instances, have been extrapolated from existing data relating to point sources. Maryland officials said that they did this on a few stream segments by subtracting the pollution load attributable to point sources from the total pollution load in a stream. However, the officials said that this method is limited; it cannot be used if point source data and data on total loading is inadequate or unavailable. Also, this method shows only how much nonpoint pollution exists, not where the pollution is coming from, whether it is the result of man's activities or natural processes, or what its impact on water quality may be.

Another problem with existing water quality data is that it is usually collected during low streamflows to determine the impacts of point sources on water quality. The assumption has been that pollution is most critical when streamflow is low because the volume of water available for diluting pollutants is low.

However, some scientists conclude that the lowest dissolved oxygen levels needed to support aquatic life are most likely to occur--especially in large rivers in developed regions--during a summer rainstorm when flows preceding the storm are generally low. Often storm runoff carries large amounts of organic pollution into receiving waters, which lowers dissolved oxygen. ^{1/} In addition, these intermittent high flow conditions raise the levels of sediment, heavy metals, and nutrients in receiving waters. Thus, if storm events are not studied, potentially important water quality impacts and sources of pollution go undetected.

The U.S. Geological Survey is conducting two urban storm water runoff studies in Portland, Oregon, intended to clarify the relationship between storm events and water quantity and quality. One study begun in 1975, expected to last about 5 years and costing over \$370,000, involves gathering data at 15 small drainage basins to identify the magnitude of storm water runoff in an urban area and determine how future urban development may affect the quantity of such runoff. The objective of the other study--a 2-year companion study costing over \$140,000--is to identify the effect of

^{1/}EPA officials said that storm runoff may cause oxygen increases or decreases in receiving water.

"* * *Studies sponsored by the NCWQ [National Commission on Water Quality] concluded that, in some areas, regulation of point source discharges alone will not improve water quality enough to meet the water quality goals. In many cases, the substantial costs involved in going from the 1977 to the 1983 standards may not noticeably improve water quality because of the small amount of pollution removed from regulated point sources compared with pollutant loadings from natural sources, unregulated agricultural activities, urban storm-water runoff, and other nonpoint sources."

In a December 21, 1976, report entitled "Better Data Collection and Planning Is Needed to Justify Advanced Waste Treatment Construction" (CED-77-12), we concluded that EPA and the States involved placed a low priority on data collection for planning purposes. Consequently, available water quality information lacked enough details to identify specific causes of water quality problems.

The report noted that costly advanced waste treatment facilities were being constructed without knowing beforehand the impact these facilities would have on improving water quality. Without adequate data on specific causes of water quality problems, such as nonpoint sources, planning officials lacked the basis for evaluating whether the plants would control the most significant source of pollution. We pointed out that more water quality benefits may be derived at less cost from controls other than advanced waste treatment.

EPA agreed with the main thrust of the report and stated that a primary deterrent to determining cause and effect relationships between advanced waste treatment and improvements in water quality was inadequate water quality data. Recognizing the need for improved data collection, EPA formed a working group to review monitoring activities and to develop program and policy revisions for advanced waste treatment planning decisions.

Need to identify the impact of control techniques on water quality

The Federal Water Pollution Control Act Amendments of 1972 require that planning for nonpoint sources identify these sources and procedures and methods for their control. Many control practices and techniques have been identified but may be difficult to implement because they are currently

poorly defined. Information is available on the pollutant load reduction that can be expected from a given control practice, but data on its impact on water quality is lacking.

No-till agriculture, for example, greatly reduces soil loss but generally requires using additional fertilizers, herbicides, and insecticides. Thus, no-till agriculture helps to control excessive erosion and sedimentation, but additional research is needed to determine its overall impact on water quality.

Furthermore, the effectiveness and cost of a technique are likely to vary depending on such factors as rainfall intensity, topography, soil, and regional cost differences. In this regard, it is currently impossible to make reliable cost-benefit analyses and make cost-effective tradeoffs between various pollution control alternatives. A rational basis for selecting control alternatives is important because land users would be reluctant to implement costly techniques, especially if water quality improvements could not be demonstrated. For example, the use of helicopters or balloons to harvest timber affords the environment better protection but can be 10 times more costly than conventional cable systems.

Efforts are underway to improve the science of nonpoint data collection

EPA research plans and activities reflect the fact that nonpoint data collection is complex and that the current information base must be greatly enlarged to achieve cost effective solutions to nonpoint pollution. In this regard, nonpoint source research projects are being carried out under each of EPA's five major environmental research programs.

The projects include, for example, research to identify practices for controlling runoff and to develop methods for predicting impacts and evaluating the cost-effectiveness of controls. Many of these research projects are being done by other Federal agencies, such as the Forest Service and the Agricultural Research Service of the Department of Agriculture, under interagency agreements with EPA.

EPA must continue to give research in the nonpoint area high priority and must quickly and effectively transfer the knowledge it acquires to State and local planning agencies.

CONCLUSIONS

The 1983 interim water quality goal of fishable and swimmable waters cannot be achieved in many regions because of nonpoint pollution. Nonpoint sources will continue to contribute many pollutants to national waters even after municipal and industrial point sources are controlled. In some instances nonpoint sources will negate the pollutant reductions obtained from point source control.

Costs to control water pollution are high and resources are limited. The Council on Environmental Quality estimates that current water pollution abatement laws will require spending \$248 billion over the next decade. Consequently, selecting cost-effective pollution control alternatives is essential, especially considering the Nation's inflation and economic problems.

To decide which water pollution controls would most benefit water quality, more and better data must be gathered on the sources, extent, and impacts of nonpoint pollution. Data is also needed on the impacts of various control techniques on water quality to assure that resulting improvements justify their costs. Currently such data is virtually nonexistent.

EPA and other Federal agencies are working together to enlarge and improve the data base so that State and local planning agencies can make informed water pollution control judgments. However, as discussed in the following chapter, various program constraints other than the technical inability to analyze nonpoint sources prevent these agencies from effectively identifying and controlling nonpoint sources of pollution.

CHAPTER 3

INSUFFICIENT EMPHASIS AND RESOURCES LIMIT

EFFORTS TO CONTROL NONPOINT SOURCES

The Environmental Protection Agency's approach to developing a comprehensive nonpoint source water pollution control program is having States and local planning agencies identify nonpoint problems, as well as develop and implement solutions. The effectiveness of this approach has been limited because

- the Federal Water Pollution Control Act Amendments of 1972 and EPA efforts have emphasized control of point sources of water pollution and
- States and local planning agencies lack the time, funds, and Federal technical assistance needed to develop adequate nonpoint source data.

Some States implemented nonpoint source controls without Federal financial and technical assistance, but these efforts have been limited also because of inadequate resources.

EMPHASIS IS ON POINT SOURCE CONTROL

The 1972 amendments emphasize control of point sources of water pollution. They require that municipal point sources use secondary treatment and that industries use the best practical waste treatment technology by July 1977. By 1983 more stringent discharge technology is required. In addition, the act provides that point sources be issued permits setting forth conditions for effluent and that these conditions be met by July 1977. To help municipal point sources comply with these provisions, the act provided \$18 billion for the construction of waste treatment facilities. Subsequent legislation added \$1.48 billion, and the President's fiscal year 1978 budget includes a proposal for a 10-year funding plan of \$4.5 billion a year.

At the time of our review, the Congress was considering amendments to P. L. 92-500 that would permit EPA to delay industry and municipal compliance with point source control requirements. The 1977 required technology levels could be delayed for 6 years for municipalities and 18 months for industries under certain circumstances, and discharges could also be granted delays and exemptions from the 1983 requirements in some cases.

Unlike point sources, the act did not specify a level of control for nonpoint sources and authorized no funds to implement nonpoint source control projects. Section 208 of the act provides for the designation and funding of State and local agencies to identify, within specified boundaries, point and nonpoint sources of water pollution and solutions to these problems.

In implementing the act, EPA emphasized promulgating point source regulations, issuing permits, and awarding construction grants to achieve statutory deadlines for point source control. Organizationally, responsibility for point source abatement was placed with a Deputy Assistant Administrator of EPA, while responsibility for nonpoint sources of pollution was delegated to the Nonpoint Sources Branch.

This Branch is one of several branches within one of three divisions reporting to a Deputy Assistant Administrator. Although this organization does not necessarily indicate the priority given to nonpoint source control, persons outside EPA may perceive a low priority. In addition, the official responsible for advocating nonpoint source concerns is several organizational layers removed from EPA's chief water quality officer.

EPA funds for point source activities totaled \$109 million in fiscal year 1976. Also, EPA awarded grants totaling \$4.3 billion in fiscal year 1976 for the construction of waste treatment facilities. Projections for fiscal year 1977 are \$93 million for point source activities and \$6.5 billion for grants.

Total EPA funds earmarked for nonpoint sources are far less than for point sources, but the amount is not readily determinable. Most nonpoint work is performed under section 208, which involves planning for 16 elements of an areawide water quality management plan. One element is nonpoint sources of water pollution, and it overlaps with some other elements of a section 208 plan, such as land-use planning. Thus, some portion of the funds granted to States and local agencies for section 208 planning--totaling \$216 million of an authorized \$368 million since program inception--is allocable to nonpoint activities.

Officials in EPA's region X estimate that 50 percent of the section 208 funds which they granted to local agencies and nearly all of the State grants will be spent on nonpoint source functions. EPA, however, does not account nationally

for the costs of nonpoint planning and control and has had difficulty estimating the cost of its nonpoint activities. Moreover, as of January 1, 1977, most grantees had spent less than 50 percent of the grant funds, and the grantees we visited had not done much planning to identify nonpoint sources of pollution. As of March 1977, agency resources to direct nonpoint activities consisted of 16 headquarters and 10 regional professional staff members.

Of the \$368 million available for section 208 planning, \$137 million could have been but was not obligated in fiscal years 1973 and 1974. Consequently, the National Association of Regional Councils brought suit against EPA, and the court ordered EPA to release these funds. The court found that EPA delays in promulgating funding and planning regulations precluded the use of these funds. In the court's opinion, section 208 planning agencies should not be penalized for the Government's slow implementation of section 208. EPA claimed its authority to obligate the \$137 million had lapsed and that the court was acting unconstitutionally in directing it to make the funds available. As of September 1977, EPA was appealing the court order.

On March 10, 1977, EPA requested a \$69 million supplemental appropriation for section 208 planning for fiscal year 1977. The Senate and House Appropriations Committees denied the request and concluded that EPA should obligate the \$137 million before additional funds are provided. The committees noted also that EPA had not obligated \$15 million of section 208 funds for fiscal year 1977. The \$15 million is also part of the \$368 million authorized since program inception.

EPA officials recognize the need to increase the priority and funding of the nonpoint area. For example, an EPA transition paper prepared for the Administration in January 1977 stated that:

"For the near term, EPA is relying on the 208 WQM [water quality management] efforts as the basic means for developing a nonpoint source program. No fundamental changes are anticipated in the near term strategy. However, an overall strategy decision must be made shortly if any significant resource re-orientation is to be made to control nonpoint sources before the end of this decade and in time to assist meeting 1983 water quality goals. If legislative re-direction is needed, then it should be included in the comprehensive 'midcourse' correction to the FWPCA

[Federal Water Pollution Control Act] which is soon [to] be undertaken by the Congress."

The transition paper stated further that EPA's water quality abatement and control program was oriented toward point source control.

In addition, representatives from various Federal, State, and local agencies attended a February 1977 meeting that EPA conducted to consider nonpoint policy issues. Many State representatives pointed out that since EPA assigned a low priority to nonpoint sources of pollution, State water quality programs developed accordingly. Some suggestions were made as to how the area might be given a higher priority, but these did not include additional funding. Rather, an EPA official told the participants that the outlook for additional funding was dim.

PROGRAM LIMITATIONS RESTRICT EFFORTS TO IDENTIFY AND CONTROL NONPOINT POLLUTION

State and local agencies lack the time and funds to develop comprehensive nonpoint plans, and EPA has been unable to sufficiently provide technical assistance or to involve other Federal agencies in nonpoint planning and control to the extent deemed necessary. These program limitations are directly attributable to the low priority given nonpoint planning and control at the Federal and State levels.

To fulfill section 208 program requirements, in May 1974 EPA issued regulations explaining the planning process and subsequently made grants to agencies designated to develop work plans. Initially, only local section 208 planning agencies; such as the Pueblo Area Council of Governments, Pueblo, Colorado; and the Columbia Region Association of Governments, Portland, Oregon; were designated to develop plans. In November 1975 EPA revised the regulations to provide that States be the planning agencies for all areas not covered by a local planning agency. These undesignated areas for which the States must plan are principally rural and account for most national land areas. By March 1977 EPA had granted funds to 176 local and 48 State agencies.

State and local plans are to identify all water quality problems--not just nonpoint pollution--in a planning area, their priorities, solutions, and agencies with the capability to implement the solutions. Once developed, plans are submitted to State Governors and EPA for approval.

As of March 1977, six draft plans had been sent to EPA for its information but none had been approved. After EPA's approval, planning agencies are to periodically update water quality plans as part of a continuing planning process. EPA is currently defining its role during plan implementation.

State and local agencies are unable to
develop comprehensive nonpoint plans

As discussed in chapter 2, more and better data on nonpoint pollution sources and impacts is needed because existing data is inadequate, and comprehensive assessments of nonpoint pollution involve sampling numerous water quality parameters at various sites over a long time. However, EPA's guidance to section 208 planning agencies on developing water quality management plans does not meet these needs. The guidance states that comprehensive studies to determine the impact specific sources of nonpoint pollution have on water quality should not be done.

Rather, EPA instructed planning agencies to concentrate on using existing data to identify major sources of nonpoint pollution and the relative contributions of pollutants from these sources. The guidance indicates that this approach was the result of time constraints. In this regard, the act provides that all planning be completed over a 2-year period, whereas EPA and the U.S. Geological Survey estimate that water quality data gathering to develop effective solutions to nonpoint pollution takes 3 to 5 years. Final plans are due on or before November 1978. Colorado officials said that adequate field studies of nonpoint sources of water pollution should have been done before many of the requirements of the 1972 amendments, including point source requirements, were implemented; however, the act did not provide adequate time to do the studies.

Along with the short time period, planning officials are concerned that funding may not be available beyond the initial 2-year period to update plans, and some said that they cannot continue without financial assistance. They added that the funding uncertainties cause hiring difficulties. We are evaluating these uncertainties as part of a current review requested by the Chairman, Subcommittee on Investigations and Review, House Committee on Public Works and Transportation.

Maryland officials said that unless more Federal funds are provided, the section 208 planning effort will only result in a refinement of point source controls and a more extensive inventory of nonpoint source problems without

extent and impact assessments. Maryland requested \$3.3 million for section 208 planning, most of which was for nonpoint planning. EPA granted \$148,000 for the 2-year planning period. A State official informed us that the grant was grossly inadequate and would inhibit State planning responsibilities. Colorado officials also are not optimistic about the future of the nonpoint source program. They said that both Federal and State funding have been inadequate which, combined with rising salaries and other program costs, will result in future staff reductions.

In addition to adequate funds, planning agencies require general guidance and technical assistance from EPA to help them prepare adequate plans. However, by April 1977, program guidance was still in draft form and an overall agency nonpoint strategy had not been published. EPA, recognizing the need for a strategy, established a task force in 1976. A task force draft report concluded, among other things, that the agency should be more involved in developing the technical data base to show the water quality improvements expected from various nonpoint controls.

Other Federal agency involvement needed
in controlling nonpoint pollution

Part of EPA's role in developing a nonpoint source control program is involving other Federal agencies that administer programs which have an impact on nonpoint pollution. EPA has identified 38 such agencies, such as the Soil Conservation Service and Forest Service in the Department of Agriculture and the Bureau of Land Management in the Department of the Interior. By September 1977 EPA signed agreements to coordinate and exchange information on nonpoint sources of pollution with 17 of these agencies.

According to EPA officials, many section 208 planning agencies use the information services of other Federal agencies, and to a limited extent, some Federal agencies assign technical personnel to assist in planning. For example, the Soil Conservation Service assigned about 50 employees to help EPA headquarters and regional offices and section 208 agencies on nonpoint source activities.

Although we did not evaluate the effectiveness of this coordination, EPA officials responsible for coordination activities said that they are strengthening the coordinating agreements to improve the delivery of the considerable expertise in other Federal agencies. The officials believe that the improvements will result in greater Federal resource

commitments and more efficient nonpoint source control programs. EPA's nonpoint source task force also recognized the need for more involvement from other Federal agencies and recommended in its preliminary report that EPA give high priority to this need.

U.S. Geological Survey officials believe that more could be done to require planning officials to inquire about the services available from various Federal agencies. The Survey, also the principal Federal water data collection agency, operates a cooperative program in which the costs of acquiring water quality data are shared equally between it and State or local public agencies. Survey officials said that while State section 208 planning agencies use this program which was funded at \$27.8 million for fiscal year 1977, local planning agencies generally do not. Survey officials believe that local agencies do not use the program because they are unaware that it exists. Therefore, they should be required to contact Federal agencies during planning activities.

Regardless of how it is initiated, interagency cooperation to control nonpoint sources of pollution is essential not only because of the information and expertise available from these agencies but also the programs they administer to protect land and water resources. Some agencies have considerable resources for activities related to nonpoint planning and control. These activities should be coordinated with nonpoint objectives to the extent possible. The Soil Conservation Service, for example, operates a program, funded at \$214 million in fiscal year 1977, to help land owners and operators adopt soil and water conservation plans. On February 14, 1977, we concluded in a report entitled "To Protect Tomorrow's Food Supply, Soil Conservation Needs Priority Attention" (CED-77-30), that the Service's approach in implementing this program was passive. We found that the Service was usually working with farmers who requested help or volunteered for the program, rather than systematically seeking and offering assistance to those with the most severe erosion control problems.

Our February report also discussed the Agricultural Stabilization and Conservation Service's administration of the Agricultural Conservation Program which provides financial support to farmers and ranchers to help them implement conservation practices. For fiscal year 1977, \$190 million was authorized for this program, and we found that in recent years most of the funds were spent on measures to enhance food production rather than for erosion controls.

In addition to available resources, interagency cooperation becomes important because the Federal Government owns one-third of all the Nation's land. Since controlling nonpoint sources depends on land management, State water pollution control and Federal land management agencies must work together to effectively control nonpoint pollution in States with large Federal land holdings. Colorado officials believe that a considerable portion of the acid mine drainage from abandoned mines in the State originates on Federal lands.

Recognizing the potential role of other Federal agencies in controlling nonpoint pollution, section 304(j) of the Federal Water Pollution Control Act Amendments of 1972 authorized EPA to allocate to the Departments of Agriculture and the Interior and the Army Corps of Engineers \$100 million a year for fiscal years 1973 and 1974. These funds were to be used in implementing approved section 208 areawide plans. However, EPA did not request the funds, and the authorization expired. The funds were not needed, according to EPA officials, because 208 planning had not begun. On July 12, 1977, EPA sent to the Congress a proposed amendment to expand the authority of section 304(j). If enacted, the amendment would (1) allow EPA to fund any Federal agency that could aid implementation of approved section 208 plans and (2) authorize \$100 million a year for fiscal years 1979 through 1983 for this purpose.

STATE EFFORTS TO CONTROL NONPOINT POLLUTION

Some States initiated actions to control nonpoint sources of pollution, independent of the 1972 amendments' requirements. These efforts as described below include enacting sedimentation, forestry practices, and other land-use laws and are among the best in the Nation, according to EPA. Although somewhat successful, these efforts are limited because of a lack of manpower and funds.

Iowa's soil erosion act

Iowa's Conservancy District Act of 1971 was enacted to control soil erosion caused by wind and water. The act allows landowners whose property is damaged by erosion to file a complaint against owners of land from which erosion is allegedly occurring. Once a complaint is filed with the soil conservation district, administrative procedures are implemented to control the erosion.

Iowa established a State cost-sharing program to support its soil conservation program. Under this program the State pays at least 75 percent of the cost to implement permanent soil and water conservation practices. The State provided \$10.5 million for this program through fiscal year 1977, according to a State official. However, Iowa reported in its water quality inventory report that necessary soil erosion control measures would cost nearly \$1.7 billion.

While the above measures help control soil erosion, some State officials believe that controls are inadequate because:

- Action must be initiated by owners or occupants of land damaged by soil erosion against other landowners. This procedure limits the act's effectiveness because (1) corrective action occurs after the damage, (2) some landowners are reluctant to file complaints against their neighbors, and (3) about 140,000 farmers reside in the State along with all the other State landowners.
- Agricultural landowners are not required to implement a conservation practice unless 75-percent cost-sharing funds are available from the State.
- Even if soil losses are controlled to specified tolerable losses, the State still lacks assurance that desired water quality will be attained because a tolerable soil loss which will protect water quality has not been defined.

Washington's Forest Practice Act

Washington's State Legislature passed in 1974 the Forest Practice Act to insure that logging operations comply with State water quality standards. The act was intended to protect water quality by controlling logging practices.

The regulations implementing the act established standards with which loggers must comply. They included regulation of logging road construction and maintenance, timber harvesting, reforestation, chemical use, and slash disposal. The act requires the development of management practices and requirements for loggers to use to comply with the law.

Washington's Department of Natural Resources administers silviculture regulations. A Department official said that the Department lacks the manpower and funds to adequately

monitor all State logging activities. Currently, the act is not enforced because, according to the official, a 2-year educational period was needed to make sure that all parties affected by the act were familiar with it.

The official said also that the Department does not monitor water quality in relation to forest practices; water quality monitoring is the Department of Ecology's responsibility. Ecology Department officials said that very little monitoring of the impact of silviculture on water quality has been done because to enforce water quality standards, they must demonstrate a violation of the Forest Practice Act or assess and document damages and then pursue court enforcement. Furthermore, the Department of Ecology lacks adequate enforcement resources, according to an official.

Maryland's sedimentation law

In 1970 Maryland passed legislation to control excessive sedimentation in developing urban areas. Maryland's Sediment Control Law provides the legal basis for State implementation of a nonpoint source control program for all grading activities, except agricultural land management practices and construction of single-family residences on lots of 2 acres or more. The act's rules and regulations were adopted on April 4, 1972.

The act's purpose is to prevent unreasonable or damaging discharges of soil and water on adjacent or downstream property. It provides for recourse to private citizens for damages and penalties for violations, including fines, imprisonment, or both.

The Sediment Control Law provides that (1) each county and municipality adopt grading and building ordinances for sediment control and (2) " * * * before the land is cleared, graded, transported, or otherwise disturbed * * * the proposed earth changes shall first be submitted to and approved by the appropriate soil conservation district or the Department of Natural Resources." Contractors or developers are required to submit a sediment control plan for approval before a building permit is issued. Sediment control ordinances are enforced locally by the appropriate county or municipal agency.

Sediment control regulations require that the Department of Natural Resources evaluate the statewide sediment control program every 3 years to determine if local jurisdictions'

programs are acceptable. The 1976 evaluation revealed that 59 of 171 sediment control programs were unacceptable with inspection and enforcement appearing to be the weakest links. Generally, the weaknesses are attributed to a lack of manpower, proper training, and administrative support from all governmental levels.

The State Water Resources Administration director said that his primary responsibility is implementing the provisions of State laws, such as the Sediment Control Law. The director said that as a matter of priorities, the State may exclude from water quality activities Federal requirements not covered by State law if Federal funding is insufficient for fulfilling them. As previously discussed, the State requested \$3.3 million to perform section 208 activities, and EPA provided \$148,000.

Pennsylvania's efforts to control acid mine drainage

On January 19, 1968, the Pennsylvania Legislature approved the Land and Water Conservation and Reclamation Act, which provided for the sale of \$500 million in bonds over a 10-year period to reclaim disturbed lands and waters. State officials said that the act's purpose was to control acid drainage from mining operations abandoned before January 1, 1968. Subsequent acts authorized \$140 million of the \$500 million for the abatement of acid mine drainage. This control project is known as Operation Scarlift.

By June 1976, \$40.5 million of the \$140 million had been spent to complete 277 projects and studies. Funds were used for source correction projects such as sealing mine shafts, design and construction of acid mine drainage treatment plants, and studies of watersheds affected by acid drainage. The State prefers source correction, rather than the construction of new treatment plants, as a solution to acid drainage and constructs treatment plants only when source correction will not work.

According to a September 1976 State report on Operation Scarlift, efforts to control acid mine drainage resulted in a complete cleanup of 48 stream miles and a considerable reduction of pollution in 140 additional miles. There were over 2,600 acres of strip mined land restored, 10 treatment plants constructed, 32 deep mine complexes sealed, and 37 refuse banks reclaimed.

However, as discussed in chapter 2, the State estimates that 2,021 miles of major streams will not meet 1983 water quality goals because of acid mine drainage from abandoned mines, sometimes combined with other pollutants. Officials estimate that \$3 billion is needed to restore them.

CONCLUSIONS

Most attempts to control nonpoint pollution have been made by the States but with relatively little success because of inadequate resources. For example, Iowa and Pennsylvania estimate that billions of dollars are needed to control single categories of nonpoint water pollution--erosion in Iowa and acid mine drainage in Pennsylvania--but have been able to appropriate only a few million dollars.

The principal nationwide effort to find and implement solutions to nonpoint sources of water pollution is the water quality management planning required by section 208 of the Federal Water Pollution Control Act Amendments of 1972. Unfortunately, the funds and time available to planning agencies to fulfill planning requirements is limited. Consequently, planning agencies were forced and instructed to prepare nonpoint plans on the basis of existing water quality data related to point sources.

In addition, EPA nonpoint planning guidance and assistance to agencies need strengthening, and opportunities exist to improve coordination with other Federal agencies administering related activities. Effective interagency coordination is essential to successful control of nonpoint sources of water pollution, especially because the Government manages one-third of the Nation's land. Because of the constraints, planning officials doubt their ability to prepare adequate plans for nonpoint pollution control.

These constraints on planning agencies are directly attributable to past and current emphasis on point source control. The 1972 amendments mandate several point source control requirements with deadlines. EPA is organized and its manpower and funds are directed accordingly. Although this emphasis resulted in progress toward cleaning up national waters, public officials acknowledge that 1983 water quality goals cannot be achieved unless more attention is given to nonpoint sources of water pollution.

We believe that removing the constraints on section 208 planning to enable appropriate data collection and analysis is an urgent need. Adequate data is needed during the

planning phase to insure that (1) the greatest sources of pollution are identified and (2) appropriate, not excessive, measures are selected for their control. This knowledge will enable water quality officials to select and implement controls having the greatest water quality benefits.

RECOMMENDATIONS TO THE ADMINISTRATOR, EPA

To give more emphasis to nonpoint sources of water pollution, we recommend that the Administrator of EPA:

- Initiate a program to provide for the collection of adequate data on cause/effect relationships among different sources of water pollution and expected impacts of various control techniques.
- Assess the resources EPA, State, and local planning agencies need to collect adequate data. The assessment should consider resources available from other Federal agencies.
- Develop legislative proposals to provide section 208 planning agencies (1) adequate time to conduct proper planning and (2) sufficient funds, on the basis of assessed funding needs.
- Promote interest and involvement in nonpoint planning and control at high levels within other Federal agencies by taking an active role through personal contact and other methods of communication.
- Develop procedures to easily identify budgeted and actual expenditures related to nonpoint planning and control.
- Place responsibility for administering the nonpoint source control program at a higher level within EPA.

Also, we recommend that the Administrator estimate the funds needed and currently available to implement nonpoint source controls and continually refine the estimate as plans for controlling nonpoint sources of pollution are completed. The Congress needs such estimates to determine if realistic progress can be made in controlling nonpoint sources of pollution on the basis of current programs or if additional funds should be appropriated.

RECOMMENDATIONS TO THE CONGRESS

This report addresses various methods to improve planning for abatement and control of nonpoint sources of water

pollution. However, for effective planning, resources must be adequate to implement nonpoint source control projects. We discuss the need for improved interagency coordination to enable more effective use of resources of other Federal agencies. In addition, State and local resources are being used to control nonpoint pollution. However, the total estimated funding needed to control nonpoint pollution and achieve 1983 water quality goals is stated in billion-dollar terms.

In view of this anticipated need and because point sources of water pollution may not be the most serious pollution in many national river basins, we recommend that the following questions be addressed during any congressional oversight hearings on the Federal Water Pollution Control Act Amendments of 1972.

- Assuming better use can be made of existing Federal, State, and local resources to implement nonpoint source controls, will these resources be sufficient to greatly reduce the pollutants attributable to nonpoint sources of water pollution, or will additional Federal funds be needed? In determining how much should be authorized for point and nonpoint controls if additional funds are needed, the overriding water quality consideration should be selecting funding mechanisms and levels to maximize achieving 1983 water quality goals.
- If funds are to be provided under the 1972 amendments for nonpoint source controls, what criteria are needed to determine eligibility for such funds, should funds be granted on a cost-sharing basis, what type controls should be funded, and how should control funds be allocated to States and local planning agencies?

AGENCY COMMENTS AND OUR EVALUATION

We sent a draft of this report for comment to EPA, the Departments of Agriculture and the Interior, and the States included in the review. The comments received were considered during final preparation of the report. Some of the more important comments are discussed here.

The respondents commenting on the report's conclusions agreed that 1983 water quality goals cannot be achieved in many places because of nonpoint sources of water pollution, and a greater effort is needed. However, EPA said that because of limited resources a sufficient monitoring program

was not feasible; therefore, section 208 agencies were told to solve obvious nonpoint problems that can be visually identified rather than to spend limited funds on extensive data collection. They said that monitoring will be increased to identify remaining nonpoint sources as section 208 planning work continues.

We do not advocate collecting data for problems which can be solved without it, and we do not believe that implementation of controls must wait until after extensive data collection. We have identified controls currently in effect, such as Maryland's sedimentation law. Similar efforts should be encouraged elsewhere to correct existing pollution and prevent future nonpoint sources without waiting for extensive data collection.

However, we emphasize the need for an adequate data collection program because our work at the planning agencies suggests that progress will be definitely limited without it. Also, serious doubt exists about the viability of the program after initial plans are completed--the phase of the section 208 program in which EPA envisions data collection. Data collection is also important because the most serious sources of water pollution need to be dealt with regardless of whether the sources are point or nonpoint. In this regard, the most obvious nonpoint sources may not be the most serious, and cost effective solutions are not always obvious. Finally, data is needed to convince people that controls are needed and not arbitrary, especially the people who will be required to implement and pay for controls.

Several comments concerned interagency coordination, especially between the Department of Agriculture and EPA. These comments pointed out that coordination is occurring but did not indicate whether it was adequate. Our conclusion that improved coordination is needed is based on the findings of EPA's nonpoint source task force and our evaluation of Department of Agriculture programs. In addition, the planning agencies lacked adequate data on nonpoint sources of pollution and needed technical assistance. We recognize that coordination is occurring; however, everyone concerned with water quality and land management at the Federal, State, and local level must work together effectively and pool their resources to solve nonpoint sources of water pollution. EPA comments are included in appendix VII.

ENVIRONMENTAL PROTECTION AGENCY CATEGORIES OFNONPOINT SOURCES OF WATER POLLUTION

1. Silviculture--man's activity in growing and harvesting timber for lumber and paper production.
2. Agriculture.
3. Mining.
4. Construction of roads and buildings.
5. Salt water intrusion into fresh water supplies.
6. Subsurface excavations, including industrial injection wells, septic tanks, and landfills.
7. Hydrologic modification--pollution resulting from changes in the movement, flow, or circulation of surface or groundwaters, including changes caused by dams, levies, channels, or flow diversions.
8. Urban runoff.

EFFORTS TO CONTROL AGRICULTURAL
NONPOINT SOURCE POLLUTION,
PALOUSE RIVER BASIN, WASHINGTON

The Palouse River Basin in eastern Washington and adjacent Idaho is a highly productive agricultural region characterized by deep, silty loess soils and rolling terrain. Some of the farmed slopes are very steep. Sixty-five percent of the area is cropland, with major crops of wheat, barley, peas, and lentils. The remainder of the Basin is primarily range and pasture. Less than 5 percent of the land is covered by forest.

Soil erosion from cropland causes the Basin severe water quality problems. Because spring runoff from cropland is so heavily silt-laden, Basin water is unsuitable for most livestock, wildlife, and human uses. Suspended sediment loads at the mouth of the Basin averaged 2,850 milligrams a liter during a 4-year study by the U.S. Geological Survey. The maximum suspended sediment considered safe to support good fish life is 80 milligrams a liter.

Although excessive cultivation is the primary reason, according to EPA regional officials, climate and physical factors unique to the Palouse greatly accentuate erosion problems. Frozen soil in much of the area limits water infiltration and contributes to high runoff and soil-loss rates. Because of these conditions combined with steep slopes, the feasibility of erosion control practices applicable elsewhere in the Nation; such as contouring, stripcropping, and terracing; are limited.

Other water quality problems in the Palouse include coliform, temperature, and dissolved oxygen violations. Levels of bacteria contamination, for example, 100 times greater than the maximum allowable value for the State, were recorded. Peak bacteria concentrations occur during high-flow (runoff) periods and the summer.

CONTROL EFFORTS

Generally, erosion control efforts centered around various Department of Agriculture programs carried out in cooperation with State and local organizations, such as conservation districts, and through the efforts of landowners and operators. These programs were primarily concerned with controlling

excessive soil losses to protect the land's long-term productivity. Only since passage of the Federal Water Pollution Control Act Amendments of 1972 has there been much awareness or concern about the impacts of nonpoint source discharges on water quality.

Presently, efforts to develop a nonpoint source control program for the Palouse evolve around section 208 planning. Washington delegated direct responsibility to the Washington State Conservation Commission for dryland agricultural problems. Two advisory committees of the commission will provide overall guidance in the development and implementation of the 208 planning process.

A third committee, the Dryland Agricultural Work Group, will assist conservation districts and other involved agencies in the organization and activities of County Water Quality committees located in counties with extensive erosion problems affecting water quality. Committee activities will be to recommend the best management practices, institutional arrangements, enforcement arrangements, and economically feasible and socially acceptable incentive proposals to improve water quality. Department of Agriculture expertise has been and, under section 208 planning, will continue to be used to solve basin water pollution problems caused by excessive erosion.

PROBLEMS AND LIMITATIONS

Much has been done to control Palouse soil erosion; however, considerable additional Federal and State efforts are needed. These efforts under the 1972 amendments face problems that may prevent the Basin from achieving the 1983 water quality goal of fishable and swimmable waters. The problems include (1) a lack of data on nonpoint source problems and the impact of these problems on water quality, (2) a lack of programs or incentives to persuade farmers to adopt erosion control practices, and (3) conflicts with other Federal and State programs.

LACK OF DATA ON THE IMPACT OF NONPOINT SOURCE PROBLEMS ON WATER QUALITY

Currently, accurately assessing the impact of agricultural activities on the Basin's water quality is difficult because of insufficient data on the cause/effect relationships of farming practices. Also, substantial erosion and sedimentation occurs in the Basin because of the combination

of topography, soils, and climate; and natural stream channel scouring contributes to turbidity and suspended sediment levels. However, these natural levels have not been measured.

Data is also needed on cause/effect relationships and economic costs of practices to control nonpoint pollution. Researchers are generally unable to say whether or how much overall water quality would be improved by using specific management practices. In other words, the use of pesticides instead of tillage operations to control weeds would undoubtedly reduce erosion, but the increased use of pesticides may harm water quality more than sedimentation.

The data collected in recent years is limited because water quality samples were generally collected on a low frequency basis because of limited manpower and funds. Basin runoff, however, is highly variable. An Agricultural Research Service study concluded that:

"* * * Runoff events of from one to a few days in length can account for large percentages of the annual sediment discharge, and the sediment transport of a given year can be as large as the total of 4 or 5 other years. Sampling programs based on weekly samples, even at stations with excellent streamflow records, can give extremely misleading results. Sampling programs of 1 or 2 years' duration can also give extremely misleading results."

Current section 208 efforts may not greatly improve the data base because (1) EPA generally discourages use of section 208 funds for data collection and (2) the 2-year time limit for developing water quality management plans is insufficient for gathering adequate data. Because of the time limit, EPA emphasizes that the States use existing data to identify control practices and to develop programs for implementing those practices.

LACK OF PROGRAMS OR INCENTIVES TO PERSUADE
FARMERS TO ADOPT EROSION CONTROL PRACTICES

A Washington official said that a main problem facing its section 208 planning is determining how to implement or enforce a nonpoint source program. The 1972 amendments did not provide funds for implementation or enforcement of nonpoint controls and did not define how these control programs would be financed. In addition, voluntary programs

have limited effectiveness, and farmers are generally apprehensive about regulatory programs.

Some farmers in the Basin have continued to use tillage and cropping practices that cause erosion because they believe that conservation practices may reduce their yields or cause them additional farming costs. For example, planting grass in areas which are subject to erosion will reduce erosion. However, this practice is resisted because land is unproductive while maintenance costs and taxes are still incurred.

CONFLICTS WITH OTHER FEDERAL PROGRAMS

Other Federal programs and regulations are not always coordinated and sometimes conflict with water quality goals. Examples follow:

- In the Palouse, Department of Agriculture farm programs generally promote farm practices to protect the soil's long-term productivity. The long-term productivity of most soils will be maintained as long as losses do not exceed 5 tons per acre per year. However, a Department researcher estimates that even if losses are held to 5 tons, with normal runoff, turbidity would still greatly exceed water quality standards. Department and State officials said that they had not determined an acceptable soil loss rate for the Palouse that would protect water quality.
- Planting grass or rotating grass with crops is generally considered to be the best protection against erosion. Under present technology, burning grass stubble is necessary for grass seeding and growing but is objectionable because of air pollution. Many State and Federal officials believe that if farmers are forced to stop burning to comply with air quality standards, soil erosion and thus water quality will get worse.
- Some tillage practices, such as no-till, reduce soil loss but require the use of herbicides to control weeds. However, environmental protection laws and regulations relating to pesticides use could discourage adoption of such practices. More effective pesticides, such as Amitrol, have already been banned for cropland use.

CONTROLLING NONPOINT POLLUTION
FROM URBAN DEVELOPMENT,
ROCK CREEK, MARYLAND

Rock Creek in the Maryland suburbs of Washington, D.C., represents a good example of man-induced degradation from rapid urbanization and land development, according to State officials. To control the effects of urban development on the stream's water quality, sediment abatement measures were taken during the construction of a shopping center in Montgomery County, Maryland.

If controls were not implemented, runoff from the construction site would have carried sediment to a small tributary of Rock Creek and to Rock Creek, which is about 1 mile away. The control measures included facilities to trap about 2,600 tons of sediment and a permanent storm water collection and delayed-release system capable of storing 846,460 gallons of water for discharge into Rock Creek through an existing storm water system.

STREAM CHARACTERISTICS

Rock Creek originates as a spring in the farming area of Montgomery County, Maryland. An area of 77 square miles drains into Rock Creek and its tributaries; 75 percent of this watershed is urbanized. The upper portion of the Creek forms Needwood Lake, which is used for fishing and boating recreation. The lower Rock Creek area is heavily urbanized and the Creek cannot be used for most recreational activities. Rock Creek empties into the Potomac River.

Rock Creek is monitored by the State and the county, and urban runoff was cited as the primary nonpoint source responsible for excessive bacteria levels. However, its water quality generally meets State temperature, dissolved oxygen, and acidity standards.

THE ABATEMENT ACTIVITY

The Montgomery County Soil Conservation District is authorized to impose storm water management practices to mitigate the impact of runoff and erosion caused by urban development. Conservation plans submitted by developers must include (1) temporary measures to control sediment generated during construction and (2) permanent measures to manage storm water after construction is completed. The district reviewed and

approved the sediment control plans for the shopping center. Approval of these plans is required before construction permits are issued by the Montgomery County Department of Environmental Protection. The department must inspect construction activities to insure proper implementation of the plan and enforce county sediment control program provisions.

The shopping center encompasses about 35 acres of drainage area. Temporary storm water and sediment abatement measures utilized during construction included constructing a sediment-retention basin, grass sodding on the banks of the basin, paving all runways leading to the basin area, and dispersing straw bale dikes throughout the job site. These measures cost about \$30,000.

The sediment-retention basin was the primary sediment control device. Covering approximately 2 acres of land, it was designed to trap about 2,600 tons of sediment while allowing storm water to drain through a system that emptied into Rock Creek about 2 miles from the construction site. Trapped sediment was removed once during construction.

The permanent storm water collection device the developer built is a reinforced concrete storage vault capable of storing 846,460 gallons of storm water. The vault allows storm water to build up and slowly drain into the storm water system, which empties into Rock Creek. Construction costs totaled about \$150,000.

The amount of sediment that was prevented from reaching the tributary and Rock Creek is unknown. Nevertheless, soil conservation and county environmental protection officials believe that the abatement measures prevented further degradation of Rock Creek.

EFFECTS OF ACID MINE DRAINAGE,
KERBER CREEK, COLORADO

Manganese, zinc, iron, copper, cadmium, and lead within a 20-mile segment of Kerber Creek exceeded suggested criteria for sustaining aquatic life. This is according to water quality data collected for the years 1972 and 1973 by the U.S. Geological Survey in cooperation with State water quality agencies. The degradation of water quality in Kerber Creek is a direct result of mining activities that occurred intermittently from the 1870s to the late 1960s. The polluted segment of Kerber Creek is in a mountainous region of Colorado near the town of Bonanza, which has a population of 10.

The previous mining activities pollute Kerber Creek in two major ways:

- Mine tailings (accumulations of waste rock separated during the mining and milling process because of their low metal content) line the sides and cover the stream beds of Kerber and Squirrel Creeks. Squirrel Creek drains into Kerber Creek. When the stream water passes through these tailings, it becomes acidic. This acid water then leaches the metals from the tailings and carries them downstream.
- Acid water drains from Rawley and several other area mines. This water passes through tailings piles above the streams and leaches out metals, which drain into Kerber and Squirrel Creeks.

Metal concentrations in Kerber Creek generally decrease downstream because of a leveling of the stream grade, a reduction in stream velocity, and the settling out of the suspended metals. Benthic (bottom dwelling) organisms appear in Kerber Creek 20 miles downstream from Rawley Mine. A Survey official said that Kerber Creek flows into San Luis Creek, but the effect of the pollution from Kerber Creek on San Luis Creek has not been determined. However, San Luis Creek does support fish.

A June 1974 Soil Conservation Service study on abatement of mine drainage into Kerber Creek recommended that diversions and pipes be used to transport water to avoid direct contact with the mine tailings. The study also proposed 3 miles of channel resectioning, rip-rapping, shaping, and vegetation of mine tailing areas along Kerber Creek.

The Service estimated that pollutants being transported downstream would be reduced by about 50 percent by employing these methods. The study indicated that these measures will help to restore Kerber Creek to a condition that will support aquatic life. The cost of installing channel resectioning and conduit pipes was estimated at \$1,142,500. These 1974 estimates did not include project administration costs. The Service study suggested that after abatement procedures are implemented, restoration of the 400 acres damaged by metal and tailing deposits could begin.

Currently, grazing along Kerber Creek begins about 3 miles downstream from Rawley Mine. Grazing increases further downstream as the valley widens. A Survey official said that area ranchers have reported that the health of their cattle has deteriorated through liver toxicity, slow weight gain, and infertility because the cattle drink from the polluted stream.

Although abatement of acid mine drainage into Kerber Creek may be possible, a State official said that currently no plans exist to implement abatement procedures. He said that Kerber Creek falls under the undesignated area of the areawide waste management planning process (section 208 of the Federal Water Pollution Control Act Amendments of 1972) and is therefore the responsibility of the Water Quality Control Division, Colorado Department of Health. Officials of this organization said that before implementation of any abatement program, the areawide waste management planning process must be completed for all streams in the State, including Kerber Creek. At that time, the streams and stream segments will be identified, the extent of the problem assessed, and the best management practices for pollution control listed. Implementation procedures will be determined after the plan is completed.

ABATEMENT OF ACID MINE DRAINAGE,
CROOKED CREEK, PENNSYLVANIA

Acid from an abandoned mining site was polluting a 4.5-mile run of Crooked Creek. A borehole from one mine, identified as the principal cause, was plugged. Stream monitoring after project completion showed definite improvements in downstream water quality. The project was funded under Pennsylvania's Operation Scarlift program.

STREAM CHARACTERISTICS

Crooked Creek lies in a rural area of the Lower Allegheny River Basin. It stretches 45 miles long, with a dam at Crooked Creek State Park near Idaho, Pennsylvania. In the headwater area, the Creek is 4 to 6 feet wide; downstream from the abatement project, the Creek reaches its maximum width of 30 feet. The dam and the Creek are used for recreation and water sports.

THE POLLUTION PROBLEM

A consultant engineering firm hired by the State studied 7 miles of the Creek near the headwaters. The study included stream sampling for 1 year (Nov. 1971 to Oct. 1972) to locate the pollution sources. For many years the area was the scene of heavy mining, causing many sources of acid drainage. One complex comprised of four mining operations was eventually identified as the major pollution source.

In addition to high acid readings, chemical analyses of data from instream sampling stations and discharges from the various outlets showed high iron and sulfate levels in the drainage water.

The consultant's report did not discuss the specific designated uses of the Creek adversely affected by the acid levels; however, a State official said no fish existed in the 7 miles of the Creek before the abatement project.

THE ABATEMENT PROJECT

Although there were several points within the mining complex from which drainage was reaching the Creek, the consultant's study pinpointed one 10-inch borehole driven down 353 feet as the principal source of the acid and iron discharges. The borehole passed through a seam of one mine and ended below in the seam of another mine. This allowed acid water

in the bottom seam to rise to the upper seam and from there to the Creek.

The consultant's report concluded that the most effective method of abating the pollution from the mining complex was permanently sealing the borehole. A plug was built and lowered into the borehole. Cement grout was pumped down the casing to seal the plug and stop the escape of acid water.

The borehole seal was constructed in August 1973; post monitoring continued until August 1974. Costs totaled \$72,068 (\$10,168 for the seal construction and \$61,900 for the consultant's fee). Because the project was part of Operation Scarlift, the funds came from the \$140 million obtained by the State from the sale of bonds.

POST MONITORING RESULTS

The Creek noticeably improved by early summer 1974, according to the consultant's report. Water bugs and minnows returned just downstream from the abatement project. At another monitoring station, about 1 mile downstream from the station near the borehole site, water quality measurements showed definite reductions in acid, iron, and ferrous levels. Thus, the project successfully improved the 7 miles of the Creek. In addition, a treatment plant was being constructed about 10 miles downstream from the borehole project to remove the pollutants from other acid-drainage sources before they reached the dam at Crooked Creek State Park.

EFFORTS TO CONTROL WATER POLLUTION CAUSED BY
SILVICULTURE, WASHINGTON

Silviculture often has severe and undesirable impacts on water quality. For example, poor logging practices over a 20-year period progressively destroyed the upper Chehalis watershed in southwestern Washington. Stream channels were clogged by numerous log jams, and about 80 percent of the fishery potential was destroyed. According to a Washington State Fishery Department study, the damage was caused by (1) poor logging road construction that caused earth slides, (2) a lack of settling basins for ditch runoff, and (3) logging operators' apathy or general disregard for stream ecology.

Efforts by the State's Departments of Ecology and Natural Resources to control water pollution caused by silviculture have not been entirely successful. Department officials said that a lack of funds and manpower, unrealistic water quality standards, and difficulties in implementing the best management practices limited progress and may hinder achieving the 1983 national goal of fishable and swimmable waters.

LACK OF DATA IDENTIFYING THE NATURE AND
EXTENT OF THE NONPOINT SOURCE PROBLEM

State officials could not provide statewide information on the extent of nonpoint source pollution caused by silviculture. Department of Ecology officials said that it is generally recognized that logging operations adversely affect water quality, but nonpoint source problems are just being examined and little data is compiled on the subject. They added that most effort is directed at monitoring point source discharges, and only limited funds and effort are directed at collecting nonpoint source data. They cited the upper Chehalis watershed as an example of the adverse effects that poor logging operations have on water quality.

UNREALISTIC WATER QUALITY STANDARDS
POSE PROBLEMS IN ADMINISTERING
NONPOINT SOURCE CONTROLS

Washington's current water quality standards may present problems in controlling nonpoint sources of water pollution caused by silviculture. They were developed for the control of point sources on interstate waters and are based on low or minimum flow. However, most nonpoint pollution induced by silviculture occurs during intense rainfall and high streamflows.

Turbidity--a principal water quality criteria relevant to silviculture--relates to the presence of particles or other pollutants in the water that causes muddy or cloudy conditions. Washington's turbidity standard is five JTU (Jackson Turbidity Units) above natural conditions. If the standard was enforced, all logging operations within the State would end, according to State officials. As a result, the State waived the turbidity standard, provided the operations comply with the State Forest Practice Act.

For example, during a visit to the upper Chehalis watershed after a light rainfall, we observed that runoff from a logging road drainage ditch polluted Chehalis East Fork River. An Ecology Department official estimated that at the point of entry turbidity measured between 1,000 to 2,000 JTU. (Figure 1 shows the effect of this runoff.) Ecology Department officials said that they do not directly enforce water quality standards relevant to silviculture. Water quality violations are referred to the Natural Resources Department to be enforced, or damages must be assessed, documented, and enforced through the courts. An Ecology Department official said that no action would be taken in this case because the logging practices employed appear to comply with the act.

Ecology Department officials, who are revising the water quality standards, believe that the turbidity standard should be replaced with a better measurement of the effects of silviculture runoff on water quality. However, they said research funds are not available.

DIFFICULTIES IN IMPLEMENTING MOST EFFECTIVE
PRACTICES FOR CONTROLLING WATER POLLUTION
CAUSED BY SILVICULTURE

Forest practices to reduce water pollution are available but not always used because they are economically unacceptable. The upper Chehalis watershed is located in a mountainous region characterized by high rainfall, steep slopes, and unstable soils. Logging operations which disturb the slope in such naturally unstable areas greatly contribute to landslides.

Management practices that limit or prevent soil movements in highly unstable areas include the use of helicopter or balloon yarding. However, the Natural Resources Department does not require loggers to use either method. A department official said that the costs of either method were prohibitive compared with the costs of other methods to harvest timber, as follows:

<u>Harvest method</u>	<u>Cost per thousand board feet</u>
Helicopter	\$ 120 - \$140
Balloon	60 - 80
Sky line	40 - 55
High lead	20 - 35
Tractor	15 - 25

State officials believe that methods that are practical for today's economy should be used and that until economical methods to log high-slope and unstable soil areas are developed, some water quality degradation should be allowed.



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

Sept. 12, 1977

OFFICE OF
PLANNING AND MANAGEMENT

Mr. Henry Eschwege
Director, Community & Economic
Development Division
U. S. General Accounting Office
Washington, D.C. 20548

Dear Mr. Eschwege:

We have reviewed your draft report on National Water Quality Goals.

We agree with the report's major conclusion that a greater nonpoint source control effort at the Federal, state, and local levels is needed and that nonpoint source pollution is a significant problem and will preclude the attainment of the 1983 water quality goals in a significant number of our nation's waterways. While the report was generally limited to an assessment of those nonpoint source activities which normally affect rural areas, we feel that the urban runoff problems are also significant.

Our comments on issues that we feel should be addressed are as follows:

1. The report stresses that additional data is needed to develop an adequate nonpoint source program. The report places considerable emphasis on the need for water quality data as a prerequisite to selection and application of appropriate nonpoint source controls. While additional data will be required, sufficient knowledge now exists for most nonpoint source activities to implement many controls. It is important to gather sufficient monitoring information on nonpoint source problems to be able to give a national overview of the problem, identify priorities, and pursue the most cost-effective national pollution control program. However, with the limited resources available to local/state agencies and the Environmental Protection Agency (EPA) for nonpoint source control, it would be unwise to encourage 208 agencies to spend their funds on extensive data collection instead of concentrating on solving the problems that are already obvious and require nothing more than visual observation to document their existence. Within present resource availability, the most cost-effective approach is to concentrate our effort on solving the most obvious problems. As these problems are resolved, then efforts will be shifted toward identification of the

next level of problems. Monitoring requirements will increase as we work on the more complex problems. This appears to be the best approach, given the resources available. The report states that a data gap on the cause and effect relationship among nonpoint source and expected impacts of various control techniques exists. EPA has not pressed for the collection of such data because the technical capability to make the assessment does not now exist and is presently being developed through our research effort.

2. Greater Federal coordination efforts regarding data collection are recommended. Other Federal agencies including the Forest Service, Agricultural Stabilization and Conservation Service, Soil Conservation Service, USDA and the Bureau of Land Management and Geological Survey, USDI have provided extensive information to many 208 agencies. Additionally, technical expertise has been made available to 208 agencies and to EPA regional offices by a number of Federal agencies. Plans are being developed with the Geological Survey to initiate a coordinated urban runoff data program to provide information on the cause and effect relationship between urban nonpoint source pollution and instream water quality. EPA has signed interagency agreements with 17 departments and agencies. Additional agreements are being developed with the Soil Conservation Service, the Federal Extension Service and the Corps of Engineers to assist in coordination of their programs with the nonpoint source program. The Soil Conservation Service has detailed more than 50 employees to EPA regional offices and to state and areawide 208 agencies to provide assistance.

3. The need for additional funds to implement nonpoint source programs is acknowledged.

a. It is important to stress that an increasing emphasis on the control of nonpoint source should in no way diminish support for the control of point sources.

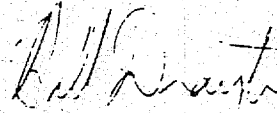
b. The Senate passed S. 1952 on August 4, 1977. Sec. 304(k) authorizes EPA to provide funds to other Federal agencies to implement nonpoint source controls required in Sec. 208 water quality management plans. The funds would be used to accelerate nonpoint source programs on public lands and to provide additional assistance to State and local water quality management agencies.

4. Chapter 3 points out the deficiencies of nonpoint source control programs in several states. We would point out that while these programs may have limitations, they are among the best in the country and represent a significant achievement which, to a great extent, has taken place with state and local funds. A major constraint to further state and local nonpoint source program implementation is the limitation of Federal, state and local funds.

3

Several recommended minor technical changes have been transmitted to the General Accounting Office previously. We appreciate the opportunity to review and comment on the draft report prior to its submission to Congress.

Sincerely yours,



William Drayton Jr.
Assistant Administrator
for Planning and Management

PRINCIPAL EPA OFFICIALS
RESPONSIBLE FOR ACTIVITIES
DISCUSSED IN THIS REPORT

	<u>Tenure of office</u>	
	<u>From</u>	<u>To</u>
ADMINISTRATOR:		
Douglas M. Costle	Mar. 1977	Present
John R. Quarles, Jr. (acting)	Jan. 1977	Mar. 1977
Russell E. Train	Sept. 1973	Jan. 1977
John R. Quarles, Jr. (acting)	Aug. 1973	Sept. 1973
Robert W. Fri (acting)	Apr. 1973	Aug. 1973
William D. Ruckelshaus	Dec. 1970	Apr. 1973
ASSISTANT ADMINISTRATOR FOR WATER AND HAZARDOUS MATERIALS:		
Thomas C. Jorling	June 1977	Present
Dr. Andrew Briedenbach	Sept. 1975	June 1977
James L. Agee	Apr. 1974	Sept. 1975
Roger Strelow (acting)		
(note a)	Feb. 1974	Apr. 1974
Robert L. Sansom (note a)	Apr. 1972	Feb. 1974
DEPUTY ASSISTANT ADMINISTRATOR FOR WATER PLANNING AND STANDARDS:		
Sweep Davis (acting)	Sept. 1977	Present
Eckhart C. Beck	Apr. 1975	Sept. 1977
Lillian D. Regelson	Mar. 1973	Apr. 1975
Robert L. Sansom (acting)	July 1972	Mar. 1973

a/ Before April 22, 1974, the title of this position was Assistant Administrator for Air and Water Programs.

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